Generally circular horizontal passage 116 extends between the pair of fluid passages 114 and horizontal fluid passage 118. Fluid passage 118 extends generally horizontally through one of the legs of main bearing housing 24. Fluid passage 118 opens to injection port 120 which extends through shell 12. Fluid injection fitting 122 is secured to shell 12 by welding and it includes a central bore 126 in fluid communication with port 120.

Thus, access from injection fitting 122 to the moving compression pockets between scroll wraps 60 and 72 is provided through bore 126, through port 120, through passage 118, through passage 116, through passages 114 and counter bore 124, and through passages 112. Fluid can be injected into the moving pockets between scroll wraps 60 and 72 or fluid can be removed from the moving pockets between scroll wraps 72 and 66 through fitting 122.

Referring now to FIGS. 4 and 5, a fluid injection system 210 according to another embodiment of the present invention is illustrated. Fluid injection system 210 is similar to fluid injection system 110 except that fluid injection system 210 incorporates an internal valve system 230 which can replace any type of external valve system incorporated with fluid injection system 110. Internal valve system 230 is disposed inside shell 12 as opposed to an external system. Internal valve system 230 comprises a slider valve 232, a valve guide support 234, a valve return spring 236 and an activating fitting 238.

Slider valve 232 is slidingly disposed within a bore 240 which intersects with generally horizontal fluid passage 118. A pair of seals 242 seal the fluid within fluid passage 118 from bore 240. Slider valve 232 defines a vapor injection through hole 244 and a modulation slot 246. Vapor injection through hole 244 is utilized for providing vapor injection into the fluid pockets between scroll wraps 60 and 72 to increase the capacity of the compressor. Modulation slot 246 is utilized for providing delayed compression by releasing the compressed fluid in the fluid pockets between scroll wraps 60 and 72 to modulate or reduce the capacity of the compressor. The combination of the vapor injection and the delayed compression allows for an increase in the modulation of the compressor when the full capacity of the compressor is with vapor injection. Assuming a compressor without vapor injection operates at 100% capacity and, with capacity modulation due to delayed compression, the capacity is reduced to approximately 60%, the incorporation of vapor injection will increase its capacity to approximately 120%. When valve system 230 switches from vapor injection to modulation, the capacity will reduce to the original 60%. Thus, a 60% capacity modulation (100% to 60%) becomes a 50% capacity modulation (120% to 60%).

Valve guide support 234 is attached to an adjacent leg of main bearing housing 24 and it defines a bore 248 which slidingly receives slider valve 232 and guides its movement. Valve return spring 236 is located between valve guide support 234 and slider valve 232 to bias slider valve 232 into its vapor injection position as shown in FIG. 4. Activating fitting 238 is in communication with one end of bore 240 through a bore 250 in fitting 238, a port 252 in shell 12 and a passage 254 in the leg of main bearing housing 24. Bore 250 is connected to a source of pressurized fluid, such as the discharge pressure of the compressor, through a valve such as a solenoid valve. When this pressurized fluid is provided to the end of bore 240, slider valve 232 moves from its position shown in FIG. 4 to a position where modulation slot 246 aligns with fluid passage 118 to permit modulation of the capacity of the compressor through a port 260 extending through main beaming housing 24. A seal 256 isolates the pressurized fluid provided through activating fitting 238. When the vapor injection feature is again desired, the pressurized fluid can be released from fitting 238 allowing valve return spring 236 to again align vapor injection through hole with passage 118 as shown in FIG. 4.

Referring now to FIGS. 6 and 7, a fluid injection system 310 according to another embodiment of the present invention is illustrated. Fluid injection system 310 provides an alternative method for accessing the moving pockets defined by wraps 60 and 72. Fluid injection system 310 comprises the pair of fluid injection passages 112, a pair of generally vertical fluid passages 314, a pair of tubing assemblies 316, a tubing connector assembly 318, a fluid injection port 320 and a fluid injection fitting 322.

Fluid passages 314 each extend generally vertical from thrust bearing surface 54 to the internal suction area of shell 12. Each fluid passage 314 comprises counter bored portion 124 which opens up on thrush bearing surface 54. Counter bore portions 124 maintain] communication with their respective injection hole 112 during all movement of orbiting scroll member 56. The lower ends of fluid passages 314 each define an enlarged bore 324 which mates with a respective tubing assembly 316.

Each tubing assembly 316 extends between tubing connector assembly 318 and a respective enlarged bore 324. Each tubing assembly 316 includes a fitting 326 which engages a respective bore 324 and a tube 328 which extends between fitting 326 and tubing connector assembly 318. A seal 330 seals the interface between bore 324 and fitting 326, and a retainer 332 keeps fitting 326 disposed within bore 324.

Tubing connector assembly 318 comprises a main bearing housing fitting 340 and a connecting tube 342. Fitting 340 is secured to main bearing housing 24 by a plurality of bolts. Fitting 340 defines an internal bore 344 which is communication with the pair of tubes 328. Connecting tube 342 is disposed within bore 344 of fitting and extends to fluid injection fitting 322. A seal 346 seals the interface between tube 342 and bore 344.

Fluid injection fitting 322 extends through port 320 and is secured to shell 12 and it defines an internal bore 350 which receives the opposite end of connecting tube 342. A seal 352 seals the interface between tube 342 and bore 350. Thus, fitting 322 is in communication with pockets of compressed moving fluid defined by wraps 60 and 72 through bore 350, tube 342, bore 344, tubes 328, fitting 326, fluid passages 314 and injection passages 112.

Fluid injection system 310 also includes a check valve 360 which allows fluid flow from fitting 322 to injection passages 112 but prohibits fluid flow from injection passages 112 to fitting 322.

While the above detailed description describes the preferred embodiment of the present invention, it should be understood that the present invention is susceptible to modification, variation and alteration without deviating from the scope and fair meaning of the subjoined claims.

What is claimed is:

1. A scroll-type compressor for handling a working fluid, said compressor comprising:

a shell having a suction zone and a discharge zone;

a first scroll member disposed in said shell and having a first scroll wrap extending from a first end plate;

a second scroll member disposed in said shell and having a second scroll wrap extending from a second end plate, said second scroll wrap being intermeshed with said first scroll wrap to define a plurality of closed pockets;

- a drive mechanism for causing said second scroll member to orbit with respect to said first scroll member, said plurality of pockets moving from a radial outer position in said suction zone to a central position in said discharge zone;
- a fluid circuit in communication with at least one of said plurality of pockets, said fluid circuit including a fluid passage extending from said one pocket to a position outside said shell, said fluid passage extending through said second scroll member; and
- a valve for controlling fluid flow through said fluid passage.

2. The scroll-type compressor according to claim **1**, wherein said valve is disposed within said shell.

3. The scroll-type compressor according to claim **2**, wherein said valve is controlled by a pressurized fluid from outside said shell.

4. A scroll-type compressor for handling a working fluid; said compressor comprising:

- a shell;
- a non-orbiting scroll member disposed within said shell and having a nonorbiting scroll wrap extending from a non-orbiting end plate;
- an orbiting scroll member disposed within said shell and having an orbiting scroll wrap extending from an orbiting end plate, said orbiting scroll wrap being intermeshed with said non-orbiting scroll member to define a plurality of closed pockets;
- a drive mechanism for causing said orbiting scroll member to orbit with respect to said non-orbiting scroll member, said plurality of closed pockets moving from a radial outer position where said working fluid is at a suction pressure to a radially inner central position where said working fluid is at a higher discharge pressure during said orbital movement;
- a fluid circuit in communication with at least one of said plurality of moving pockets, said fluid circuit including a fluid passage extending from said one pocket to a position outside of said shell, said fluid pocket extending through said orbiting scroll member; and
- a valve for controlling fluid flow through said fluid passage.

5. The scroll-type compressor according to claim **4**, wherein said valve is disposed within said shell.

6. The scroll-type compressor according to claim **5**, wherein said valve is controlled by a pressurized fluid from outside said shell.

7. A scroll-type compressor for handling a working fluid, said compressor comprising:

- a shell having a suction zone and a discharge zone;
- a first scroll member disposed in said shell and having a first scroll wrap extending from a first end plate;
- a second scroll member disposed in said shell and having a second scroll wrap extending from a second end plate, said second scroll wrap being intermeshed with said first scroll wrap to define a plurality of closed pockets;
- a drive mechanism for causing said second scroll member to orbit with respect to said first scroll member, said plurality of pockets moving from a radial outer position in said suction zone to a central position in said discharge zone;
- a fluid circuit in communication with at least one of said plurality of pockets, said fluid circuit including a fluid passage extending from said one pocket to a position outside said shell, said fluid passage extending through said second scroll member;
- a housing disposed within said shell, said housing supporting said second scroll member, said fluid passage extending through said housing; and
- a valve disposed within said housing, said valve controlling fluid flow through said fluid passage.

8. The scroll-type compressor according to claim **1**, wherein said valve is controlled by a pressurized fluid from outside said shell.

9. A scroll-type compressor for handling a working fluid; said compressor comprising:

- a shell;
- a non-orbiting scroll member disposed within said shell and having a nonorbiting scroll wrap extending from a non-orbiting end plate;
- an orbiting scroll member disposed within said shell and having an orbiting scroll wrap extending from an orbiting end plate, said orbiting scroll wrap being intermeshed with said non-orbiting scroll member to define a plurality of closed pockets;
- a drive mechanism for causing said orbiting scroll member to orbit with respect to said non-orbiting scroll member, said plurality of closed pockets moving from a radial outer position where said working fluid is at a suction pressure to a radially inner central position where said working fluid is at a higher discharge pressure during said orbital movement;
- a fluid circuit in communication with at least one of said plurality of moving pockets, said fluid circuit including a fluid passage extending from said one pocket to a position outside of said shell, said fluid pocket extending through said orbiting scroll member;
- a housing disposed within said shell, said housing supporting said orbiting scroll member, said fluid passage extending through said housing; and
- a valve disposed within said housing, said valve controlling fluid flow through said fluid passage.

10. The scroll-type compressor according to claim **9**, wherein said valve is controlled by a pressurized fluid from outside said shell.

11. A scroll-type compressor for handling a working fluid, said compressor comprising:

- a shell having a suction zone and a discharge zone;
- a first scroll member disposed in said shell and having a first scroll wrap extending from a first end plate;
- a second scroll member disposed in said shell and having a second scroll wrap extending from a second end plate, said second scroll wrap being intermeshed with said first scroll wrap to define a plurality of closed pockets;
- a drive mechanism for causing said second scroll member to orbit with respect to said first scroll member, said plurality of pockets moving from a radial outer position in said suction zone to a central position in said discharge zone;
- a fluid circuit in communication with at least one of said plurality of pockets, said fluid circuit including a fluid passage extending from said one pocket to a position outside said shell, said fluid passage extending through said second scroll member; and
- a housing having a plurality of legs disposed within said shell, said housing supporting said second scroll member, said fluid passage extending through one of said legs of said housing.

12. The scroll-type compressor according to claim **11**, further comprising a valve disposed within said housing, said valve controlling fluid flow through said fluid passage.

13. The scroll-type compressor according to claim **12**, wherein said valve is controlled by a pressurized fluid from outside said shell.

14. A scroll-type compressor for handling a working fluid; said compressor comprising:

a shell;

a non-orbiting scroll member disposed within said shell and having a nonorbiting scroll wrap extending from a non-orbiting end plate;

an orbiting scroll member disposed within said shell and having an orbiting scroll wrap extending from an orbiting end plate, said orbiting scroll wrap being intermeshed with said non-orbiting scroll member to define a plurality of closed pockets;

a drive mechanism for causing said orbiting scroll member to orbit with respect to said non-orbiting scroll member, said plurality of closed pockets moving from a radial outer position where said working fluid is at a suction pressure to a radially inner central position where said working fluid is at a higher discharge pressure during said orbital movement;

a fluid circuit in communication with at least one of said plurality of moving pockets, said fluid circuit including a fluid passage extending from said one pocket to a position outside of said shell, said fluid pocket extending through said orbiting scroll member; and

a housing having a plurality of legs disposed within said shell, said housing supporting said orbiting scroll member, said fluid passage extending through one of said legs of said housing.

15. The scroll-type compressor according to claim **14**, further comprising a valve disposed within said one leg of said housing, said valve controlling fluid flow through said fluid passage.

16. The scroll-type compressor according to claim **15**, wherein said valve is controlled by a pressurized fluid from outside said shell.

17. A scroll-type compressor for handling a working fluid, said compressor comprising:

a shell having a suction zone and a discharge zone;

a first scroll member disposed in said shell and having a first scroll wrap extending from a first end plate;

a second scroll member disposed in said shell and having a second scroll wrap extending from a second end plate, said second scroll wrap being intermeshed with said first scroll wrap to define a plurality of closed pockets;

a drive mechanism for causing said second scroll member to orbit with respect to said first scroll member, said plurality of pockets moving from a radial outer position in said suction zone to a central position in said discharge zone;

a fluid circuit in communication with at least one of said plurality of pockets, said fluid circuit including a fluid passage extending from said one pocket to said suction zone of said compressor, said fluid passage extending through said second scroll member; and

a housing disposed within said shell, said housing supporting said second scroll member, said fluid passage extending through said housing.

18. The scroll-type compressor according to claim **17**, further comprising a valve disposed within said housing, said valve controlling fluid flow through said fluid passage.

19. The scroll-type compressor according to claim **18**, wherein said valve is controlled by a pressurized fluid from outside said shell.

20. The scroll-type compressor according to claim **18**, wherein said fluid passage is in communication with an injection port extending through said shell and said valve is movable between a first position where said one pocket communicates with said suction zone of said compressor and a second position where said one pocket communicates with said injection port extending through said shell.

21. A scroll-type compressor for handling a working fluid, said compressor comprising:

a shell having a suction zone and a discharge zone;

a first scroll member disposed in said shell and having a first scroll wrap extending from a first end plate;

a second scroll member disposed in said shell and having a second scroll wrap extending from a second end plate, said second scroll wrap being intermeshed with said first scroll wrap to define a plurality of closed pockets;

a drive mechanism for causing said second scroll member to orbit with respect to said first scroll member, said plurality of pockets moving from a radial outer position in said suction zone to a central position in said discharge zone;

a fluid circuit in communication with at least one of said plurality of pockets, said fluid circuit including a fluid passage extending from said one pocket to said suction zone of said compressor, said fluid passage extending through said second scroll member; and

a valve for controlling fluid flow through said fluid passage; wherein;

said valve is disposed within said shell; and

said valve is controlled by a pressurized fluid from outside said shell.

22. The scroll-type compressor according to claim **21**, wherein said fluid passage is in communication with an injection port extending through said shell and said valve is movable between a first position where said one pocket communicates with said suction zone of said compressor and a second position where said one pocket communicates with said injection port extending through said shell.

23. A scroll-type compressor for handling a working fluid, said compressor comprising:

a shell having a suction zone and a discharge zone;

a first scroll member disposed in said shell and having a first scroll wrap extending from a first end plate;

a second scroll member disposed in said shell and having a second scroll wrap extending from a second end plate, said second scroll wrap being intermeshed with said first scroll wrap to define a plurality of closed pockets;

a drive mechanism for causing said second scroll member to orbit with respect to said first scroll member, said plurality of pockets moving from a radial outer position in said suction zone to a central position in said discharge zone;

a fluid circuit in communication with at least one of said plurality of pockets, said fluid circuit including a fluid passage extending from said one pocket to said suction zone of said compressor, said fluid passage extending through said second scroll member; and

a housing having a plurality of legs disposed within said shell, said housing supporting said first scroll member, said fluid passage extending through one of said legs of said housing.

24. The scroll-type compressor according to claim **23**, further comprising a valve disposed within said housing, said valve controlling fluid flow through said fluid passage.

25. The scroll-type compressor according to claim **24**, wherein said valve is controlled by a pressurized fluid from outside said shell.

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